REMARKS

The present invention relates to a process for the deposition of films on substrates by sputtering or magnetron sputtering for the fabrication of multilayer systems.

With respect to the Office Action dated June 17, 2008, it is, first, appreciated that the Examiner has withdrawn the rejection under 35 U.S.C. § 112, and has not reiterated the rejection under 35 U.S.C. § 102.

However, at pages 2 - 7 of the Office Action, the pending claims were rejected under 35 U.S.C. § 103(a) based on modified versions of the earlier §103(a) rejections. Particularly, claims 1 and 10 were rejected under 35 U.S.C. § 103(a) based on Kobayashi in view of Pinarbasi. Claims 3, 8, 12, 15, and 17 were rejected under 35 U.S.C. § 103(a) based on Donohue et al in view of Telford. Lastly, claim 6 was rejected under 35 U.S.C. § 103(a) based on Kobayashi and Pinarbasi further in view of Gupta et al. Furthermore, at pages 7 - 9 of the Office Action, the Examiner responded to Applicant's arguments.

In accordance with the amendments and the detailed remarks herein, Applicant respectfully requests reconsideration and withdrawal of the rejections, and the allowance of claims 1, 3, 6, 8, 10, 12, and 14 - 17.

Independent claim 1 is amended by reciting the feature that a new layer is deposited in a first and a subsequent deposition stage, and in that the first and second deposition stage are performed with the same target, as disclosed, e.g., in Example 2, at page 13, last paragraph, to page 14, second paragraph of the specification (corresponding to paragraphs [0049] to [0051] of the patent application publication).

Independent claim 3 is amended by adding the feature that a new layer is deposited in a first and a subsequent deposition stage, as disclosed e.g., in Example 4, at page 19, first paragraph, to page 20, first paragraph of the specification (corresponding to paragraphs [0058] to [0060] of the patent application publication). Claim 3 is furthermore amended by reciting the feature that the fabricated multilayer system is reflective for radiation in the EUV wavelength range, as disclosed, e.g., at page 20, last paragraph of the specification (corresponding to paragraph [0067] of the patent application publication).

Below, Applicant further explains the patentability of the present claims vis-à-vis the cited references.

Patentability of claim 1:

Kobayashi discloses a sputtering process for a thin film with a mean free path of particles being smaller than the distance between target and substrate, corresponding to the first deposition stage of claim 1 above.

Pinarbasi discloses a sputtering process for single-layered or multi-layered structures with a mean free path which may be chosen to be greater than the distance between target and substrate.

At page 8 of the Office Action, it was argued that it would be obvious for one of ordinary skill in the art to include the teachings of Pinarbarsi (as a second deposition stage) in the process of Kobayashi to gain the advantage of optimized layers for single-layered and multi-layered structures.

Applicant respectfully disagrees. Pinarbasi teaches that for "optimizing selected properties of each layer for single-layered or multilayered structures, both the mass of the ion beam sputtering gas and the energy of the ion beam is controlled as a function of the target material" (abstract). Thus, Pinarbasi teaches optimizing of selected properties of individual layers of multilayered structures in dependence of the target material used, thus selecting an optimized property for each individual layer material deposited on the substrate. However, in contrast to claim 1 above, Pinarbasi does not disclose or hint at changing any processing parameter during the deposition of a single layer, i.e., when the same target material is used.

As neither Kobayashi nor Pinarbasi disclose a two-stage process for the deposition of the same layer, both Kobayashi and Pinarbasi fall short of disclosing changing the free path length

between two deposition stages of the deposition of the same layer, i.e., during the deposition of the same target material.

Moreover, both Kobayashi and Pinarbasi fall short of recognizing the benefits of such a change of process parameters as is explained in paragraph [0033] of the application, namely that by starting the deposition of a layer with thermalized particles, intermixing may be avoided, and that after the first deposition stage, non-thermalized particles may be used in the deposition of the layer for controlling the growing film's roughness (see page 14, second paragraph of the specification (corresponding to paragraph [0049])).

Patentability of claim 3:

First of all, neither Donohue nor Telford discloses a process for the fabrication of multilayer films which are reflective for radiation in the EUV wavelength range: Donohue discloses a method of sputtering, from a target, a layer onto a substrate having a plurality of recesses or openings (abstract); no reference is made to the production of thin films which are reflective for EUV radiation. Telford discloses a method of deposition of a tungsten silicide film onto a substrate. Tungsten silicide films are used in the manufacture of semiconductor integrated circuits such as schottky barriers, ohmic contacts, and gate metallizations; see Telford, at column 1, line 16, to column 19. Thus, a person of ordinary skill in the art would not have been taught, motivated, or have any reason to use the teachings of Telford and/or those of Donohue for the production of EUV-reflective multilayer systems.

Donohue discloses a method of sputtering a layer from a target using krypton as the sputtering gas. The product of pressure and distance may be higher than 2.0 cmPa or lower than 2.0 cmPa depending on the operating conditions of the sputtering system.

However, Donohue does not discuss separating the deposition process of a single layer into two deposition stages, and, in particular, does not discuss using a product of pressure and distance higher than 2.0 cmPa in a first deposition stage and lower than 2.0 cmPa in a subsequent deposition stage.

Although Telford et al (US Patent No. 5,643,633) teaches using a two-stage process with a first, high-pressure stage followed by a low-pressure stage, combining the teachings of Telford with those of Donohue would not be obvious to a person of ordinary skill in the art, for at least the following reasons:

As Applicant previously noted, Telford describes the two-stage process only with respect to a CVD process, whereas Donohue relates to sputtering, which is a PVD process. However, at page 8 of the Office Action, the Examiner asserted that Telford discloses that it is known in the prior art to have two deposition parts of distinct pressure also in a PVD apparatus, citing column 1, lines 45 - 49. Applicant respectfully but strongly disagrees, as the cited passage reads as follows

> "At first, tungsten silicide films were deposited by physical vapour deposition techniques such as sputtering and electron-beam

> evaporation. However, these techniques gave films with poor conformal coverage over the steps and trenches of the polysilicon layer and non-uniform stoichiometry".

In addition to the fact that in the cited paragraph Telford clearly teaches away from using PVD techniques for the deposition of tungsten silicide films, there is no indication therein at all teaching or suggesting a PVD process having two deposition steps for limiting contamination between the different deposition stages. In particular, the fact that different pressures may lead to limiting contamination seems to be a specific characteristic of the deposition of tungsten silicide films in a CVD apparatus, referring to column 7, line 58 of Telford:

> "It is believed that by operating initially at a higher pressure, the tendency of contamination to cause deposition of WSi_x strata with a silicon to tungsten ratio lower than desired is overcome".

Thus, the skilled person would have no indication whatsoever that the two-stage process described in Telford for the deposition of tungsten silicide could be advantageous for the deposition of other materials or that the two-stage process may be of use for limiting contamination also in a PVD process.

Moreover, as has already been stated by the Applicant in the response to the first Office Action, in the CVD procedure of Telford, the pressure range is completely different from the pressure used in the present application, as the pressures described in Telford are contained in a range from 0.5 Torr to 20 Torr, (see column 7, lines 41 to 43, i.e., at or above 66.65 Pa). For a

pressure of 66.65 Pa, a product of 2.0 cmPa or less may only be attained when the distance between the substrate and the target is 0.3 mm or less, i.e. when the target and the substrate are in contact with each other. Consequently, the person of ordinary skill may only learn from Telford to use two different pressures, both of which will result in a product of distance and pressure well above 2.0 cmPa when a reasonable distance between target and substrate is used.

In summary, none of the documents cited in the Office Action or any combination of these documents provides disclosure or content that teaches, suggests, motivates, or provides other reason based on which a person of ordinary skill in the art would be led to the presently claimed invention.

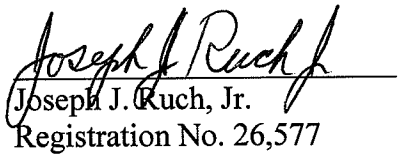
In view of the foregoing, Applicant respectfully submits that entry of this Amendment is appropriate, and provides basis for withdrawal of the rejections under 35 U.S.C. § 103(a) in view of the deficiencies of the cited art, as described above.

In view of the above, entry of the Amendment, reconsideration, and allowance of claims 1, 3, 6, 8, 10, 12, and 14 - 17 of this application are now believed to be in order, and such actions are hereby earnestly solicited.

If any points remain in issue which the Examiner feels may be best resolved through a personal or telephone interview, the Examiner is kindly requested to contact the undersigned attorney at the local Washington, D.C. telephone number listed below.

The USPTO is directed and authorized to charge all required fees, except for the Issue Fee and the Publication Fee, to Deposit Account No. 19-4880. Please also credit any overpayments to said Deposit Account.

Respectfully submitted,



Joseph J. Ruch, Jr.
Registration No. 26,577

SUGHRUE MION, PLLC
Telephone: (202) 293-7060
Facsimile: (202) 293-7860

WASHINGTON OFFICE
23373
CUSTOMER NUMBER

Date: October 14, 2008